

Agenda Item No. 9

**Meeting of the Reclamation Board
April 18, 2008
Board Staff Report
West Sacramento Flood Control Agency**

Item

Consider approval of a letter to the U. S. Army Corps of Engineers requesting that the Corps initiate, in cooperation with the West Sacramento Area Flood Control Agency, a joint programmatic review of possible improvements to the levees protecting the community of West Sacramento under the National Environmental Policy Act and the California Environmental Quality Act.

Project

West Sacramento Levee Improvement Program, City of West Sacramento, Yolo County.

Description

The West Sacramento Flood Control Agency is currently conducting a comprehensive evaluation of the levee system that provides flood protection to the City of West Sacramento. The levee system is part of the Sacramento River Flood Control Project. The West Sacramento Levee Improvement Program will identify the problems of the levee system and implement corrective action projects aimed at providing a minimum level of 200-year flood protection.

Under the WSLIP, the West Sacramento Levee System is divided into two distinct basins; the North Area, consisting of approximately six square miles and the South Area, consisting of approximately five square miles. The North Area basin is bounded by the Port North Levee and the Deep Water Ship Channel to the south; the Sacramento River West-North levee to the east and north; the Sacramento Bypass levee to the north; and the Yolo Bypass to the west. The South Area basin is bounded

by the Port South levee and DWSC to the north; the Sacramento River West-South levee to the east; the South Cross Levee to the south; and the DWSC East levee to the west (Exhibit 1).

WSAFCA is seeking to develop a programmatic joint Environmental Impact Statement/Environmental Impact Report for this project to analyze broad environmental effects of all corrective action projects that could be implemented. Specific projects will then tier-off from the programmatic document. WSAFCA may also include in the joint programmatic EIS/EIR some project level analysis on specific projects that they have already identified including work on the Sacramento Bypass, Sacramento River West-North Levee, Sacramento River West-South Levee, and any other specific projects that may be identified during the preparation of the document.

Because the Board is the State agency that provides the Corps assurance for operation and maintenance of project levees and its partner in the management of flood control in the Central Valley, the U. S. Army Corps of Engineers looks to the Board for assistance and initial determination in considering any changes or alterations to the project flood control works proposed by other parties. The request for initiating the preparation of a joint EIS/EIR would come from the Board.

Staff Recommendation

Staff recommends that the Board approve sending the attached draft letter requesting the Corps to initiate a joint programmatic review for the West Sacramento Levee Improvement Project under NEPA and CEQA and to delegate the authority to the Executive Officer to sign the letter.

EXHIBITS

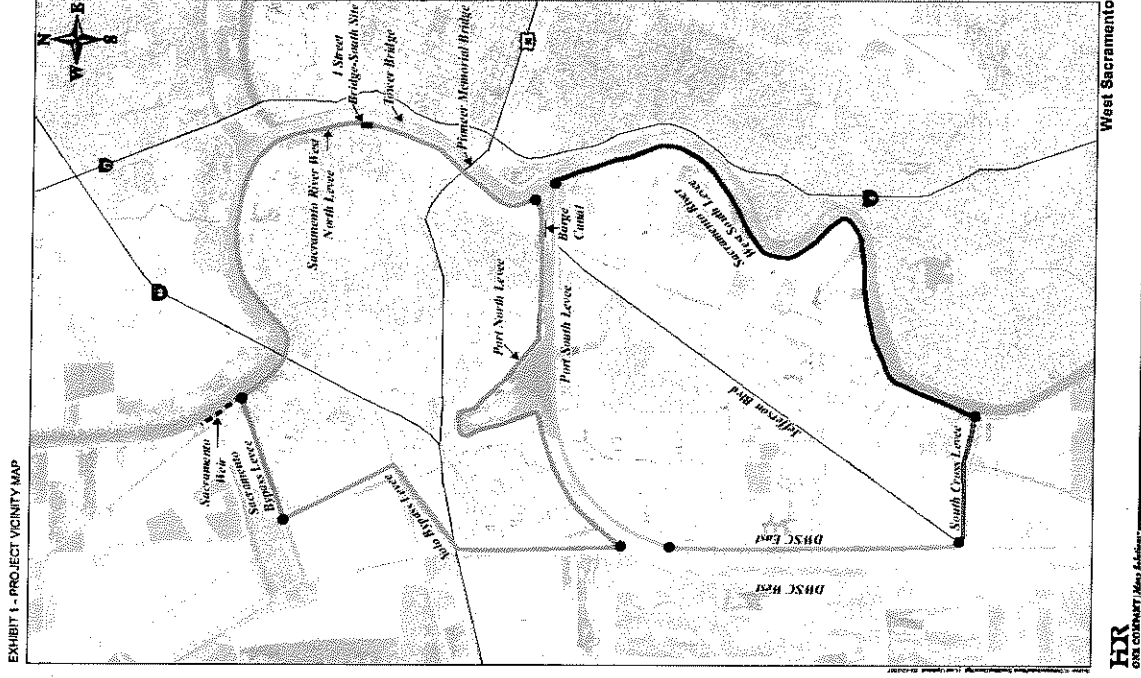
Exhibit 1 - Map of the City of West Sacramento Levee System

Exhibit 2 - Draft Request Letter

Exhibit 3 - Draft WSAFCA West Sacramento Levee Improvement Program

A Framework For Early Implementation Projects

Exhibit 1 – Project Vicinity Map



April 18, 2008

Colonel Thomas C. Chapman, P. E.
District Engineer
Sacramento District
U. S. Army Corps of Engineers
1325 J Street
Sacramento, California 95814

Dear Colonel Chapman:

The West Sacramento Flood Control Agency (Agency) is currently conducting a comprehensive evaluation of the levee system that provides flood protection to the City of West Sacramento. The City's levee system is part of the Sacramento River Flood Control Project.

On behalf of the Agency, the Central Valley Flood Protection Board (Board) requests the U. S. Army Corps of Engineers, in cooperation with the Agency, to initiate a joint programmatic review of the West Sacramento Levee Improvement Program (WSLIP) to comply with the provisions of the National Environmental Policy Act and the California Environmental Quality Act. The Agency will serve as the lead agency under CEQA and it is our understanding that the Corps will serve as the lead agency under NEPA.

Under the WSLIP, the levee evaluation includes problem identification of existing levees, an alternatives analysis of various potential levee improvements and alterations, and development of conceptual cost estimates associated with those improvements and alterations. The goal of the WSLIP is to achieve a minimum level of 200-year flood protection for the City of West Sacramento. The Board, on behalf of the Agency, will seek approval from the Corps to make the necessary alterations to the levee system to achieve the goal.

Thank you for your attention to this request. We look forward to working with you and your staff and the staff of the West Sacramento Flood Control Agency on this project. If you have any questions regarding this request, please call me at (916) 574-0609 or your staff may contact Dan Fua, Supervising Engineer for the Board, at (916) 574-0698.

Sincerely,

Jay S. Punia, Executive Officer
Central Valley Flood Protection Board

cc: Mr. Kenneth A. Ruzich, Manager
West Sacramento Flood Control Agency
1420 West Merkley Way, Office #4
West Sacramento, California 95691

DRAFT

West Sacramento Area Flood Control Agency

West Sacramento Levee Improvement Program (WSLIP):

A Framework for Early Implementation Projects

TABLE OF CONTENTS

1.0	Introduction.....	1
1.1	Purpose & Scope.....	1
1.1.1	Overview.....	1
1.1.2	Need for Proposed Project	1
1.1.3	Purpose of this Report.....	2
1.2	Background.....	2
1.2.1	Sacramento Urban Levee Reconstruction Project	3
1.2.2	Formation of WSAFCA.....	3
1.2.3	West Sacramento Project	3
1.2.4	General Re-evaluation Report.....	3
1.3	Related Studies.....	4
2.0	Conditions, Problems and Needs	5
2.1	Existing Conditions.....	5
2.1.1	Two West Sacramento Basins.....	5
2.1.2	Levee System	5
2.1.3	Connection to the SRFCP	7
2.1.4	Frequency of Flooding.....	7
2.1.5	Flood Damages	8
2.2	Flood Problems and Needs	8
2.2.1	Seepage	8
2.2.2	Slope Stability.....	8
2.2.3	Inadequate Levee Freeboard	9
2.2.4	Erosion	9
2.2.5	Encroachments and Vegetation.....	10
2.2.6	Seismic Vulnerability.....	10
3.0	Early Implementation Projects.....	11
3.1	Goals.....	11
3.2	Project selection process.....	11
3.2.1	Early Implementation Project Criteria and Constraints.....	11
3.2.2	Early Implementation Project Objectives	11
3.3	Early implementation strategy	12

List of Tables

Table 2.2.1: Erosion Site Identification	10
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List of Plates

Plate 1: Sacramento River Flood Control Project & Project Location Map.....	13
Plate 2: West Sacramento Levee Reaches	14
Plate 3: Underseepage and Through-Seepage Levee Risks.....	15
Plate 4: Currently Identified Levee Deficiencies.....	16

ACRONYMS AND ABBREVIATIONS

City	City of West Sacramento
Comprehensive Study	Sacramento-San Joaquin River Basins Comprehensive Study
CVFPB	Central Valley Flood Protection Board
DWR	California Department of Water Resources
DWSC	Deep Water Ship Channel
FEMA	Federal Emergency Management Agency
GRR	General Re-evaluation Report
JPA	Joint Powers Authority
NEPA	National Environmental Policy Act
NFIP	National Flood Insurance Program
Port	Port of West Sacramento
RD	Reclamation District
Reclamation	U.S. Bureau of Reclamation
RM	River Mile
SACOG	Sacramento Area Council of Governments
SRFCP	Sacramento River Flood Control Project
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
WRDA	Water Resource Development Act
WSAFCA	West Sacramento Area Flood Control Agency
WSLIP	West Sacramento Levee Improvement Program

1.0 INTRODUCTION

1.1 Purpose & Scope

1.1.1 Overview

The West Sacramento Area Flood Control Agency (WSAFCA) is proposing to begin design and construction of improvements to the levee system that surrounds the City of West Sacramento in California (Plate 1). Early improvements are part of the West Sacramento Levee Improvement Program (WSLIP). The goal of the WSLIP is to achieve a minimum level of 200-year flood protection for the City of West Sacramento (City). The 200-year flood is a flood event that has a 0.5% chance of occurring in any given year.

The City's comprehensive flood control strategy has been guided by the following objectives adopted by the WSAFCA in connection with the WSLIP: 1) provide at least a 200-year level of flood protection to the City over-time 2) complete urgent levee improvements in advance of construction by the U.S. Army Corps of Engineers (USACE) with funding assistance from the California Department of Water Resources (DWR), 3) partner with the USACE and DWR to coordinate efforts on the development of technical documents and the development of a General Re-evaluation Report (GRR), and 4) identify opportunities to work with local and regional partners to complete work efficiently and to supplement local funding.

The WSLIP seeks to meet all of the USACE's current levee design criteria. Early implementation projects constructed in advance of USACE construction (referred to herein as "early implementation projects") will be improved to at least a 200-year level of protection. The remaining reaches of the levee system protecting the City will be improved to meet applicable standards for the 200-year water surface elevation from 2012 to 2016. This work will be carried out by the USACE following completion of a GRR and Congressional approval for expanding the scope of the West Sacramento Project. It is anticipated that the GRR will be completed in n 2010.

1.1.2 Need for Proposed Project

The following sections describe the history of the levee improvements in the City, the nature of existing levee deficiencies, the studies currently being performed that will be used to develop a plan to implement levee improvements, and the overall strategy for the City to achieve its flood control goals. Program Context [italicize and retain 1.1.1]e City, along with the two districts providing operation and maintenance of the existing levee, Reclamation District (RD) 900 and RD 537, has actively pursued the goal of providing reliable flood protection for the West Sacramento area. Working through WSAFCA, and in coordination with the USACE, the Central Valley Flood Protection Board (CVFPB), and DWR, two major flood control projects have been completed. The first was constructed from 1990 through 1993 as part of the Sacramento Urban Levee Reconstruction Project. The second project was the West Sacramento Project constructed between 1998 and 2002.

However, even as design work was nearing completion on the West Sacramento Project, underseepage was noted along the Sacramento Bypass levee in 1997 and stability issues became apparent in 1998 along the RD 537 levee. The City and RD 900 requested the USACE to conduct additional geotechnical investigations and incorporate design changes to address these issues. As a result, the completed West Sacramento Project was modified to reconstruct an entire section of RD 537 levee to replace the original clay and organic material with engineered fill, and place a 60 to 70 foot deep slurry wall to control underseepage along the segment where the Sacramento Bypass and Yolo Bypass levees intersect.

In the wake of the 1997 storms, the USACE identified under-seepage as an area of concern. Only recently, however, has the USACE issued revised federal levee design criteria to provide a consistent approach for addressing potential levee under-seepage. The geotechnical and engineering investigations currently being conducted for West Sacramento levees have utilized the revised federal levee design criteria. Current engineering analysis depicts the nature of levee deficiencies. WSAFCA's team of consultants is currently working to identify necessary improvements to provide a 200-year level of flood protection for the City.

1.1.3 Purpose of this Report

The purpose of this Report is to describe the City's approach to addressing the problems of its levee system and to incorporating necessary treatment measures into early implementation projects aimed at providing a minimum level of -200-year flood protection. This approach heavily depends on the USACE and the State to approve and cost-share early implementation projects.

1.2 Background

The early implementation projects are part of a larger West Sacramento Levee Improvement Program of improvements to the flood control system protecting the City. This section outlines the key events and actions that have shaped the West Sacramento Levee Improvement Project so as to provide the historical and legislative context within which the early implementation projects are being pursued.

Large Flood Events

1986 - The record flood of 1986 caused levee failures in many areas of the Sacramento Valley that resulted in hundreds of millions of dollars of property damage and exposed numerous deficiencies in the Sacramento River Flood Control Project (SRFCP). In the Sacramento area, these deficiencies included: (1) unstable levees along the west bank of the Sacramento River that were susceptible to failure due to the porous nature of the material used in their construction, and (2) inadequate reservoir storage capacity for controlling large floods in the American River watershed.

1997- In the wake of the 1997 storms, the USACE identified under-seepage as an area of concern. Only recently, however, has the USACE issued revised federal levee design criteria to provide a consistent approach for addressing potential levee under-seepage. The geotechnical and engineering investigations currently being conducted for West Sacramento levees have utilized the revised federal levee design criteria. The current

engineering analysis has resulted in the identification of levee deficiencies and necessary improvements to provide a 200-year level of flood protection to the City.

1.2.1 Sacramento Urban Levee Reconstruction Project

The Sacramento Urban Levee Reconstruction Project was constructed from 1990 through 1993 and placed a stability berm and related features to address through-seepage along the entire length of the Sacramento River levee bordering the Southport area.

1.2.2 Formation of WSAFCA

The WSAFCA is a Joint Powers Authority (JPA) created in 1994 through a Joint Exercise of Powers Agreement by the City, RD 900 and RD 537. WSAFCA was established to coordinate the planning and construction of flood protection facilities within the boundaries of the JPA and to help finance the local share of flood control projects.

WSAFCA formed an assessment district in 1995 to fund the local cost share of the West Sacramento Project, which is part of the federal Sacramento Metro Area project authorized by the Water Resources Development Act (WRDA) of 1992. This assessment, coupled with a further assessment created in 2007, is funding geotechnical and engineering investigations of the Sacramento River levees and the southern boundary cross levee in the Southport area. The maximum total 1995 WSAFCA assessment amount was \$5.85 million, whereas the 2007 WSAFCA assessment is expected to finance about \$41 million in bond proceeds for future levee improvements.

RD 900 is responsible for operating and maintaining the detention basins and pump stations, as well as the majority of the levees protecting the City, with RD 537 and State Maintenance Area #4 maintaining the balance. RD 900 and RD 537 impose an annual Operation and Maintenance Assessment on properties within their jurisdictional boundaries to pay for the cost of operation and maintenance of this system of levees and flood control facilities.

1.2.3 West Sacramento Project

The West Sacramento Project was authorized by the 1992 WRDA (PL 102-580) and amended by the Energy and Water Development Appropriations Act of 1999 (PL 105-245). The West Sacramento Project was constructed between 1998 and 2002; it involved raising more than a mile of the south levee of the Sacramento Bypass by up to 5 feet and raising 4.5 miles of the Yolo Bypass levee by up to 5.5 feet. The West Sacramento Project was designed to provide the City with greater than a 200-year level of protection.

1.2.4 General Re-evaluation Report

Changes in engineering standards affecting the WSAFCA flood control elements prompted WSAFCA to begin re-evaluating the levee system in advance of the USACE. The USACE, in partnership with the State, is preparing to embark upon the development of a GRR for West Sacramento's levee improvements. WSAFCA has partnered with DWR and the USACE by sharing levee investigation information between agencies and working together in the evaluation of the data that has been collected. By working closely with the USACE in the development of the technical reports, WSAFCA hopes

that the information can be easily incorporated into the development of a GRR. WSAFCA will incorporate feedback from the USACE and DWR so that the level of detail, the methodology used, and the results meet the USACE standard of care. WSAFCA's goal is to work cooperatively with the USACE to expedite the development of the GRR. The results of this effort will be reflected in a GRR that will be presented to Congress (estimated to occur in 2010) with recommendations as to what scope and cost modifications may be needed to ensure that the project as a whole can achieve its flood risk reduction objectives.

WSAFCA's early implementation projects are proceeding ahead of this submittal date and in advance of any Congressional authorization in order to address urgent needs. On that basis, WSAFCA anticipates that most of the non-Federal costs incurred in the early implementation project would be credited against the remaining non-Federal share of the cost of the WSLIP.

1.3 Related Studies

The Flood Control Implementation Strategy is part of a larger group of studies and reports being prepared in connection with the West Sacramento Levee Improvement Project. Drafts include:

- WSLIP Draft Environmental Impact Report;
- WSLIP Draft Environmental Impact Statement;
- WSLIP Draft Problem Identification Report;
- WSLIP Draft Alternatives Analysis; and
- WSLIP Draft Risk and Benefit Analysis.

These documents will facilitate USACE and State planning and regulatory activities in connection with the early implementation project and will contribute to completion of USACE's GRR on the West Sacramento Levee Improvement Program. As discussed above, the GRR will serve as the vehicle for Congress to expand authorization of the West Sacramento Project to address recent changes in engineering design standards. It is anticipated that the GRR will be presented to Congress in 2010.

2.0 CONDITIONS, PROBLEMS AND NEEDS

2.1 Existing Conditions

2.1.1 Two West Sacramento Basins

A flood emergency preparedness mapping study was prepared by Wood Rogers for the City found that for the 100 year event the City acts as two distinct basins. The City is bifurcated by the Port of West Sacramento (Port) (Plate 2). A breach north of the Port is projected to only inundate the northern basin and a breach the south of the Port is projected to only inundate the southern basin. The study did not examine how the basins would respond if flooding occurred from a levee breach during the 200-year flood event. The discussion below likewise assumes that the West Sacramento Levee System behaves as two distinct basins under the 100 year flood event.

North Area Basin- The North Area, representing approximately six square miles, is bounded by the Port North Levee and the Deep Water Ship Channel (DWSC) to the south, the Sacramento River West – North Levee to the north and east, the Sacramento Bypass Levee to the north, and the Yolo Bypass Levee to the west. Land in this area varies in elevation from El. 20.0 feet at the north boundary to El. 16.0 to 18.0 feet adjacent to the DWSC. The north bank of the DWSC is generally about El. 19.5 feet. This area is traversed by the right bank of the Sacramento River from RM 63.0 to RM 57.5.

South Area Basin – The South Area incorporates approximately five square miles and varies from El. 18.0 feet to El. 8.0 feet. The area is bounded by the Port South Levee and the DWSC to the north, the Sacramento River West-South Levee to the east, the South Cross Levee to the south, and the DWSC East Levee to the west. The South bank of the DWSC from Lake Washington to the Sacramento River is generally at approximately El. 19.5 feet. The right bank of the Sacramento River extends from RM 57.7 to RM 51.5.

2.1.2 Levee System

2.1.2.1. North Basin

Yolo Bypass Levee – extends for approximately 3.7 miles along the eastern levee of the Yolo Bypass extending from the intersection of the Sacramento Bypass and the Yolo Bypass until the intersection with DWSC West, also known as the Navigation Levee (Plate 2). An access road runs along the levee crown and is in adequate condition. The majority of the waterside slope is covered with riprap.

Sacramento Bypass Levee – extends for approximately 1.13 miles along the southern levee of the Sacramento Bypass from the confluence of the Sacramento River and the Sacramento Bypass until the intersection of the Sacramento Bypass and the Yolo Bypass (Plate 2). A section of the waterside slope of the levee has a concrete covering to prevent erosion. There also exists an access road along the top of the levee which appears to be in adequate condition.

Sacramento River West-North Levee – extends for approximately 5.5 miles along the Sacramento River western levee from the Sacramento Bypass until the confluence of the

Barge Canal. North Harbor Blvd. runs along the levee crown for a section of this reach. The road then drops off the levee and an access road continues until it dead-ends into a DWR facility (Plate 2). River Crest Drive travels along the levee crown inside of The Rivers residential development with houses on the widened levee crown. There are several other structures on the levee crown along the Sacramento River West North Levee as it extends into commercial and industrial areas. The Levee also fades into and then out of a natural area of high ground known as the Triangle.

Port Levee North – extends for approximately 4.9 miles along the northern bank of the Port of Sacramento extending from the confluence of the Barge Canal and the Sacramento River until the intersection with the Yolo Bypass Levee (Plate 2). There are many structures along the levee for use at the Port of Sacramento. The levee appears to be more of a raised section of land within an industrial district rather than an actual levee. There are many access points due to the presence of the Port of Sacramento and the industrial district.

2.1.2.2 South Basin

Sacramento River West-South Levee – extends approximately 5.9 miles along the Sacramento River western levee from the Barge Canal at the confluence of the Sacramento River to the South Cross Levee (Plate 2). South River Road runs along the top of the Sacramento River West South Levee for the majority of this reach. The road diverts off of the levee top and runs along the landside toe for a short distance. The Sacramento Northern Railroad line runs on top of the levee along the stretch of levee where South River Road runs along the landside toe. South River Road returns to the top of the levee at the southernmost tip of Sacramento River West South Levee and the railroad diverts to the landside toe. Several overhead power lines cross over the levee and run alongside the landside hinge point throughout Sacramento River West South Levee.

South Cross Levee – extends for approximately 1.2 miles from Jefferson Boulevard to the Sacramento River where it connects with the southern end of the Sacramento River West South Levee (Plate 2). The slopes of this levee have vegetation and large trees growing sporadically throughout the reach. The levee crown is covered by a thin layer of aggregate base roughly 12 feet wide.

Deep Water Ship Channel East – extends for approximately 2.8 miles south along the eastern levee of the DWSC from the conclusion of the Port South Levee until the intersection of the South Cross Levee (Plate 2). The levee is comprised primarily of dredged material from the construction of the DWSC with a gravel access road along the levee crown. The access road is in need of repair and maintenance to improve accessibility.

Deep Water Ship Channel West – extends for approximately 21.4 miles south along the western levee, also known as the Navigation Levee, of the DWSC from approximately the mid-point of the bend in the DWSC to Miner Slough (Plate 2). The levee is comprised primarily of dredged material from the construction and subsequent cleaning of the DWSC with an access road along the levee crown. There appears to be an extensive supply of material which could be used as fill to repair and improve other sections of the levee system. Further investigation is required to determine the adequacy and quantity of the potential fill material.

Port South Levee – extends for approximately 4 miles from the confluence of the Sacramento River and the Barge Canal, west along the southern levee of the Port of Sacramento (Plate 2). The levee is comprised primarily of dredged material from the construction of the DWSC with a gravel access road along the levee crown. The access road is in need of repair and maintenance to improve accessibility.

2.1.3 Connection to the SRFCP

As shown in Plate 1, the perimeter levee system around the City is part of an integrated system of levees, overflow bypass channels, and dams that comprises the SRFCP. This flood control system was initially designed to improve navigation and reduce the risk of flooding to facilitate agricultural development of the extensive floodplains located in the Sacramento Valley. The design included levees set closely along the rivers. The levees set closely along the rivers ensured that high velocities in the river would help scour the river bottom and move sediment through the system to reduce dredging costs and sustain navigation. The bypasses were conceived of as the primary conduits for flood flows during major floods. Together, the river channels and bypasses were designed to transport a flood of the magnitude of the 1907 and 1909 Sacramento River floods.

Over time, the capacity of the SRFCP was greatly expanded by the construction of five major multiple purpose reservoirs (Shasta, Black Butte, Oroville, New Bullards Bar, and Folsom Reservoirs) containing 2.7 million acre-feet of dedicated flood space. These dams were justified in part by public safety considerations, specifically the need to provide a high level of flood protection to the historical urban settlements that grew up at the confluence of the Feather and Yuba Rivers (Yuba City and Marysville) and the American and Sacramento Rivers (Sacramento and West Sacramento).

The City is subject to flooding from a combination of flows in the Sacramento and American River channels and the Yolo Bypass. Along the northern and eastern perimeters of the basin, the greatest threat is from a large flood in the Sacramento-Feather River Basin combined with high runoff from the American River. This threat is mitigated by the operation of the Sacramento Weir and Yolo Bypass system. Along the western perimeter of the basin, the greatest threat is from a large flood in the Yolo Bypass. The South Cross Levee in the Southern portion of the levee system does not pose a great risk of flooding to the City, because levee failures would have to occur down stream to the Deep Water Shipping Channel or the Sacramento River before any water could be seen against the South Cross Levee.

2.1.4 Frequency of Flooding

The probability (or frequency) of an uncontrolled flood in the City is linked to the hydrology of the lower Sacramento Valley and the performance of the levees comprising the SRFCP, including the levees around the City. The hydrology of the lower Sacramento Valley was extensively analyzed as part of the Comprehensive Study. These data have been used to create hydraulic models that route the estimated runoff for various flood events through the river and stream channels comprising the SRFCP and estimate the resulting water surface elevations. In very large floods, such as the 100- year and 200- year floods, which exceed the design capacity of the SRFCP, these correlations are highly sensitive to assumptions about the performance of SRFCP levees. If the SRFCP levees

upstream of the City are assumed to fail when overtopped, the 100-year and 200-year floods produce much lower water surface elevations in the channels around the City (by 1 to 2 feet) than if it is assumed these upstream levees will not fail when overtopped.

2.1.5 Flood Damages

An uncontrolled flood in West Sacramento would cause substantial direct damage to structures and contents and, depending on the timing and circumstances of the flood, pose a serious threat of loss of life and injury. Based on the Comprehensive Study performed by the USACE in 2000, the structures and contents that could be damaged by a flood in the City are estimated to have a depreciated replacement value of approximately \$3.5 billion in 2007 dollars (calculated December 2007).

Exterior (river and drainage channel) and interior (floodplain) water surface elevations were developed for a range of flood events based on the hydrology and hydraulics models discussed above. Flood inundation-damage relationships were developed based on analytical functions developed by USACE in connection with the Comprehensive Study.

2.2 Flood Problems and Needs

2.2.1 Seepage

Seepage beneath and through segments of the levee system has been identified as a significant risk to the stability and reliability of the system. Underseepage problems occur in locations where levees are constructed on low-permeability foundation soil (silt and clay) underlain by higher-permeability layers (sand and gravel). Excessive underseepage makes the affected levee segment susceptible to failure during periods of high river stage. Under these conditions, seepage travels horizontally under the levee and then is forced vertically upward through the low-permeability foundation layer, often referred to as a "blanket." Failure of the blanket can occur either by uplift, a condition in which the blanket does not have enough weight to resist the confined pressure acting upon the bottom of the blanket, or by piping (internal erosion) caused by water flowing under high vertical gradients through the erodible blanket and carrying fine soil particles out of the foundation materials. Through-seepage is seepage through a levee embankment that can occur during periods of high river stage. Depending on the duration of high water and the permeability of embankment soil, seepage may exit the landside face of the levee. Seepage can also pass directly through pervious layers in the levee if such layers are present. Under these conditions, the stability of the landside levee slope may be reduced. Plate 3 shows a schematic of these two failure mechanisms. Plate 4 shows the locations around the City where seepage has been identified as a problem at the 200-year design water surface elevation.

2.2.2 Slope Stability

URS completed an engineering evaluation of levee slope stability and impact of rapid drawdown for the northern reaches of the basin and presented its findings in the report titled "Phase 1 Geotechnical Evaluation Report West Sacramento Region," (2007). URS used water surface elevations which are different than the water surface elevations determined by MBK Engineers in its analysis of slope stability. Sections of the northern reaches have not been completed to date by URS; these sections will be completed in its

final report projected to be issued September 2008. Plate 4 shows the areas that appear to have slope stability deficiencies.

2.2.3 Inadequate Levee Freeboard

Freeboard is a measure of the height of a levee above a defined water surface elevation. Based on the modeling studies referenced in Section 2.1.4, all of the levee reaches protecting the City have segments that provide less than the 3 feet of freeboard that is required to meet the minimum requirements for 200-year flood protection established by the State. Water surface elevations assume SRFCP levees outside the West Sacramento Basins do not fail when overtopped. Plate 4 shows the locations around the West Sacramento Basins where inadequate freeboard has been identified as a problem.

2.2.4 Erosion

An evaluation of the erosion potential for the West Sacramento Levee System was performed as part of the problem identification report prepared by HDR. This information was provided to HDR by Northwest Hydraulic Consultants in the form of a Problem Identification Report dated September 2007 and titled, "West Sacramento Levee System, Problem Identification Report, Erosion Assessment and Treatment Alternatives."

As shown in Plate 4 ten sites were identified as having significant erosion, lacking revetment and in need of significant repair on Sacramento River West South Levee and three sites were identified on Sacramento River West North Levee. Two sites on DWSC East have also been identified as possible areas of concern which require further inspection. Two sites along the Yolo Bypass Levee have experienced revetment failure but they are currently being repaired by DWR. In general, erosion of natural banks has been identified by fallen trees, a lack of vegetation, minor slumping or loss of soil on the bank, or exposure of soil, steep undercut slopes, and wave-cut benches or deep scour near the bank toe. Erosion of revetment has been indicated by loss of riprap or by slumping and failure of the existing rock. Fifteen sites are labeled A through O beginning at the upstream end of each reach and are listed in Table 2.2.1.

Table 2.2.1: Erosion Site Identification

Site	Upstream Station	Downstream Station	Length (ft)
Sacramento River West-South Levee			
A	312+00	307+00	500
B	304+50	302+00	250
C	289+50	282+50	700
D	281+00	279+50	150
E	278+00	274+00	400
F	268+50	266+00	250
G	241+00	229+00	1200
H	229+00	179+00	5000
I	167+00	163+00	400
J	132+00	115+00	1700
Sacramento River West-North Levee			
K	183+00	183+70	250
L	184+75	188+00	350
M	194+25	198+50	500
DWSC West Levee			
N	10+00	12+00	200
O	100+00	102+00	200

2.2.5 Encroachments and Vegetation

USACE levee guidance that is under reconsideration requires the removal of vegetation greater than 2 inches in diameter on the levee slopes and within 15 feet of the waterside and landside levee toes. This guidance also requires removal of encroachments on the levee slopes, including utilities, fences, structures, retaining walls, driveways, and other features that penetrate the levee prism. Should any of these existing encroachments be determined to threaten the integrity of the levee or otherwise increase flood risk unacceptably, the encroachments would need to be removed or reconstructed to meet the USACE construction criteria.

2.2.6 Seismic Vulnerability

A preliminary seismic evaluation has been completed for DWR by URS and its findings have been presented in the report "*Phase I Geotechnical Evaluation Report West Sacramento Region*" dated September 2007. URS performed the evaluation for the northern reaches of the basin. Kleinfelder issued a Memorandum titled "*Preliminary Seismic Evaluation; West Sacramento Levee Assessment; Sacramento River; Reach 1 (Sacramento River Right Bank Levee); Reclamation District 900; Yolo County, CA*" dated June 2007.

There are differences in the methodologies used by URS and Kleinfelder. Since these differences appear to be significant in nature, a meeting was arranged to allow seismic experts the opportunity to discuss and develop a standard methodology to be used in future seismic evaluation. To date no formal methodology has been agreed upon.

3.0 EARLY IMPLEMENTATION PROJECTS

3.1 Goals

The goals of the West Sacramento Levee Improvement Program and the early implementation projects are to:

- Provide a minimum level of 200-year flood protection to the City.
- Reduce risks to public safety as quickly as possible.

3.2 Project selection process

Early implementation projects were chosen from among those in the West Sacramento Levee Improvement Program as a whole pursuant to the following tasks:

- Establish specific objectives to resolve identified flood problems and, to the extent possible, related problems and needs.
- Define constraints and criteria for formulating an implementable strategy.
- Identify and evaluate related measures to address the project goals.
- Develop an array of alternatives consistent with planning constraints and criteria.
- Leverage funding from local and regional partners to supplement levee improvement funds when possible. Compare and evaluate the alternatives and recommend an implementation plan.

3.2.1 Early Implementation Project Criteria and Constraints

WSAFCA's financial constraints limit its ability to implement all of the levee improvements that are needed to provide the City with a minimum levee of 200-year flood protection. The following criteria have been used to prioritize early implementation projects sites to be pursued.

- Availability of funds;
- Real estate requirements;
- Scalability of construction;
- Land use and project comparability;
- Permit requirements;
- Multiple objectives and benefits.

3.2.2 Early Implementation Project Objectives

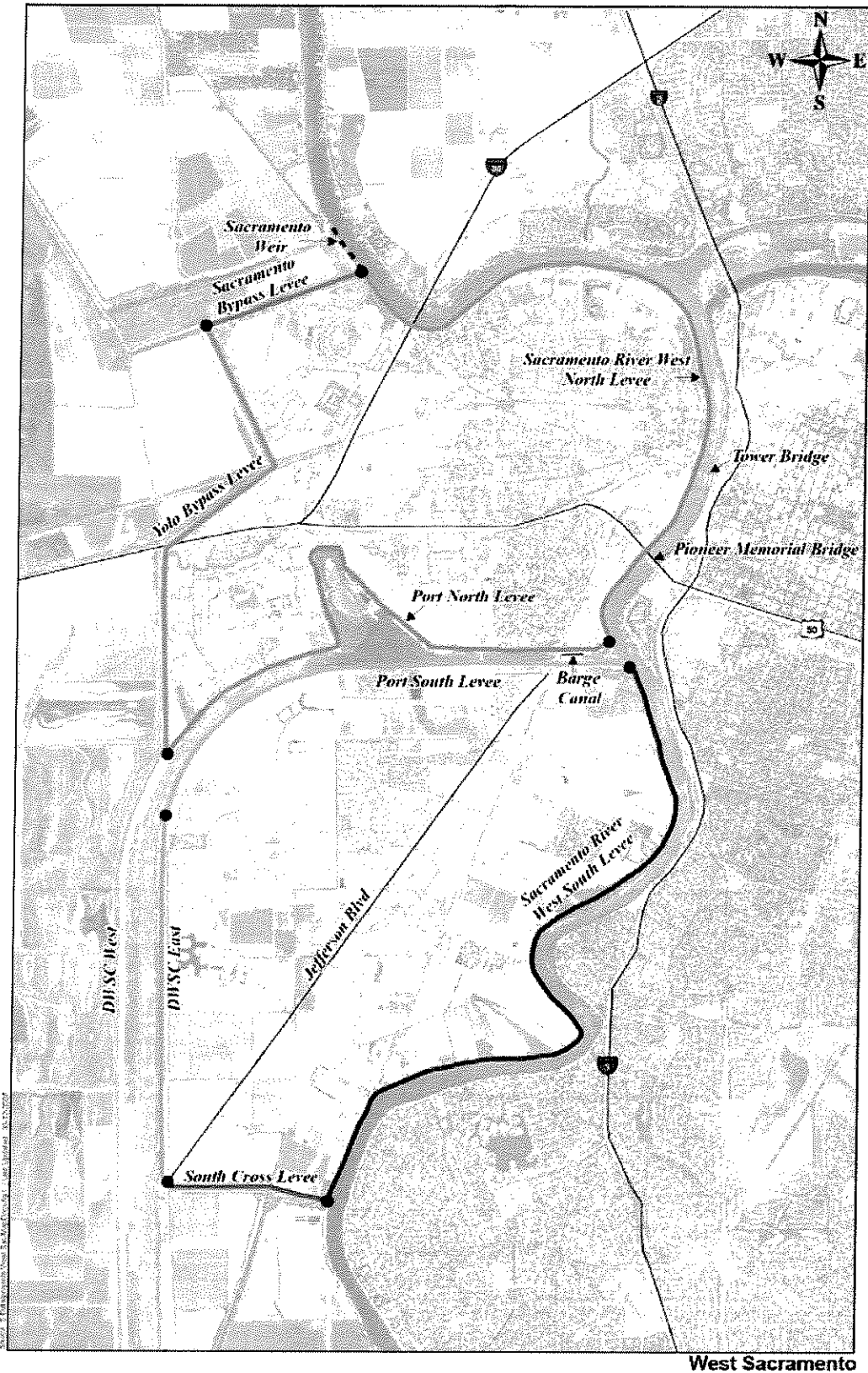
- the proposed project will alleviate geometry, stability, under- and through-seepage concerns;
- the cost will not exceed available funding;

- the proposed project will not create an increased flood risk problem for surrounding levee districts;
- the proposed project will be constructed as soon as possible to reduce flood risk;
- the proposed project will not affect the ability of the Central Valley Flood Protection Board to implement future system-wide flood protection improvements; and
- the proposed project will be politically, socially, and environmentally acceptable.

3.3 Early implementation strategy

WSAFCA's strategy is to construct urgently needed levee improvements as quickly as possible with the support of State, Federal and regional partners.

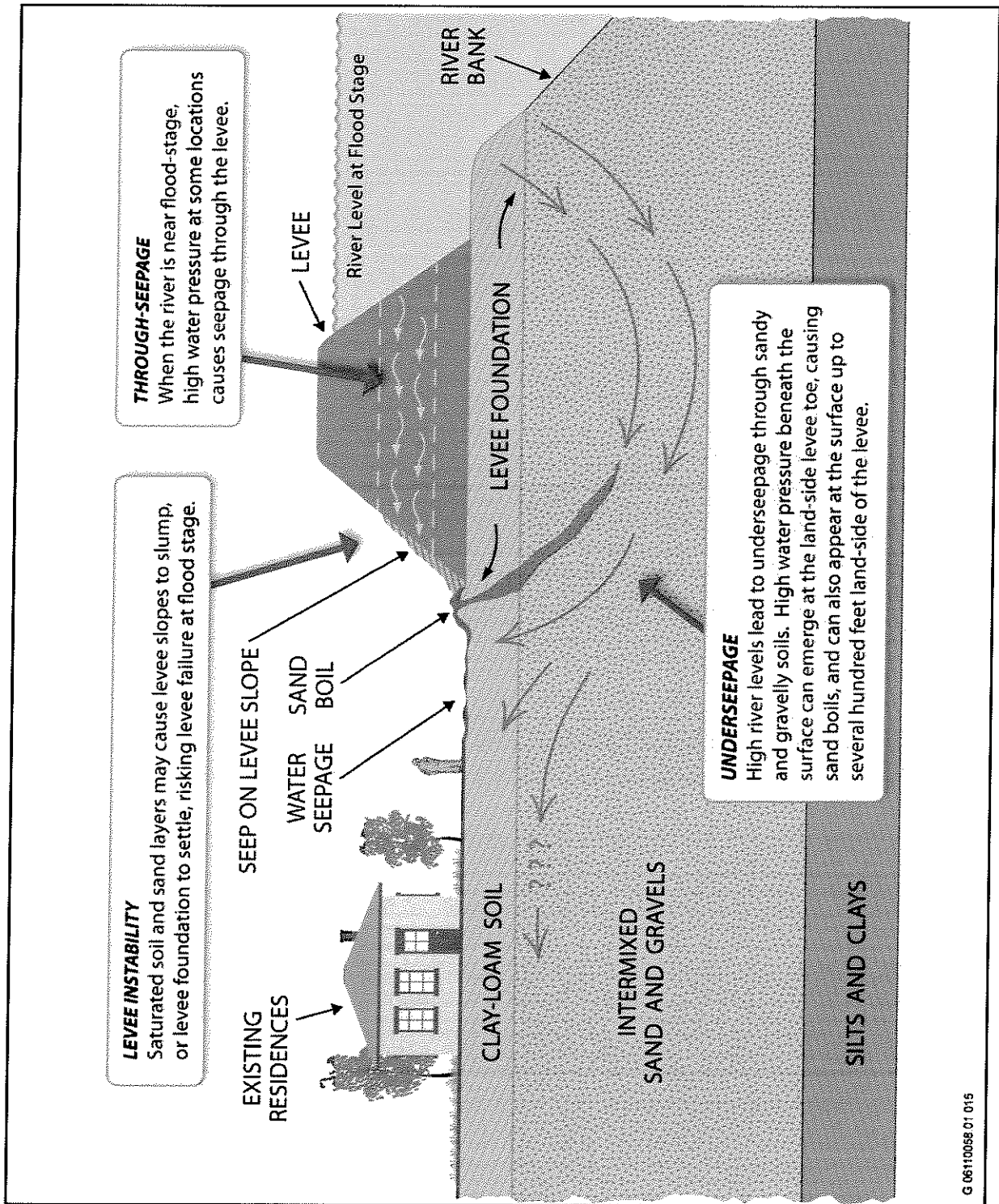
- Use local funding and partner with DWR to construct as many urgent levee improvements as possible in advance of the project as a whole being authorized by Congress and subsequent completion by the USACE.
- Prioritize levee improvement sites to reduce the risk of flooding and achieve multiple benefits
- Partner with other local and regional agencies to draw upon other funding sources



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Source HDR Problem Identification Report

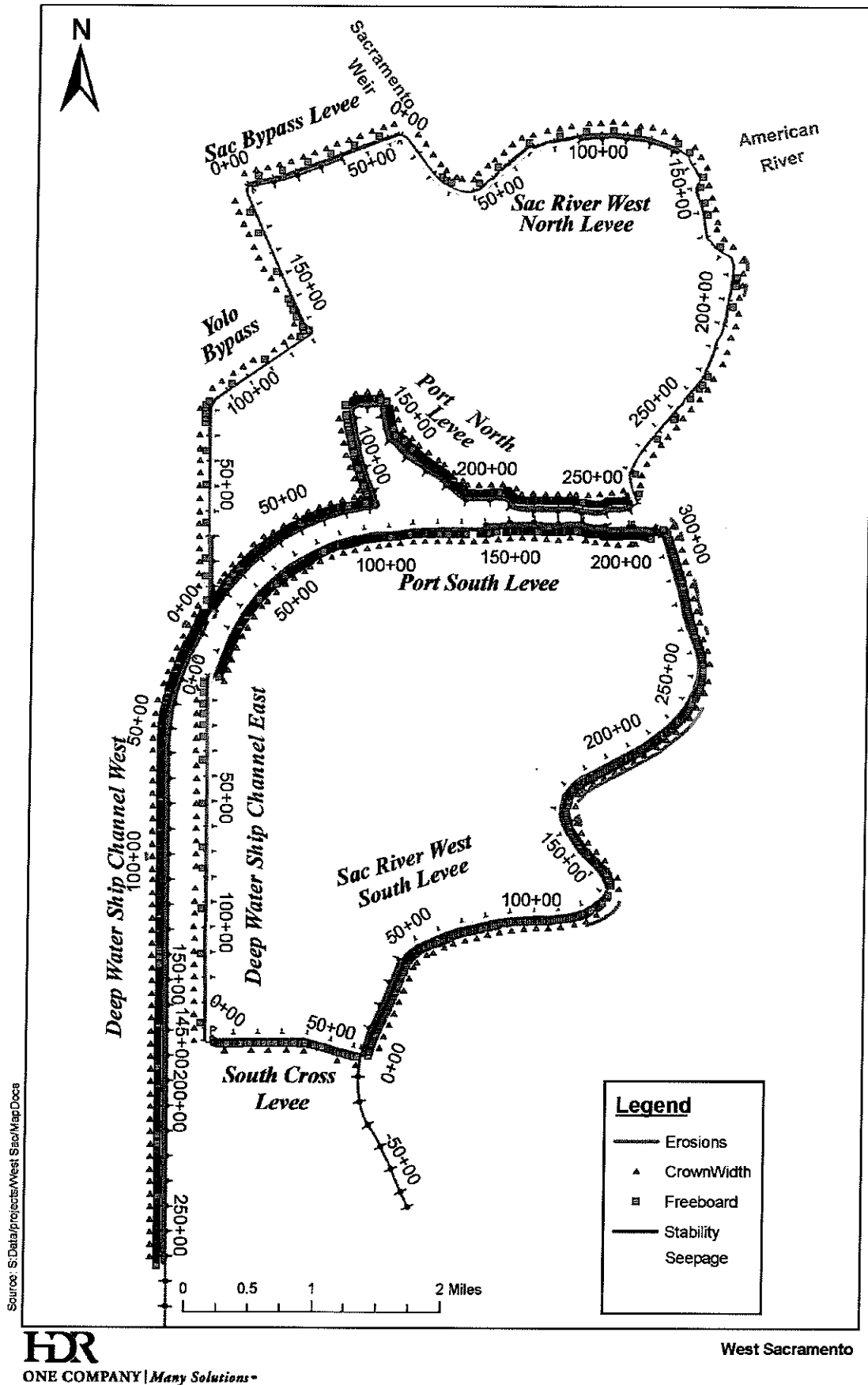
Plate 2: West Sacramento Levee Reaches



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Source SAFCA 2007, NLIP Landside Improvements Project DEIR

Plate 3: Underseepage and Through-Seepage Levee Risks



Source HDR Problem Identification Report

Plate 4: Currently Identified Levee Deficiencies